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EXAMINER	
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ART UNIT	**PAPER NUMBER**
2121	8

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/866,414	DISCENZO ET AL.	
	Examiner	Art Unit	
	Aaron C Perez-Dapl	2121	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 May 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-56* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-56* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *5/25/01* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *3,6,7*.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. This Action is in response to Application filed 5/25/01, which has been fully considered.

2. This Action is non-Final.

3. Claims 1-56 are presented for examination.

Drawings

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Referring to the rejection of claim 42 under 35 USC 112, below, it is not clear to the Examiner whether the Applicant intends to claim a feedback signal from the controller to the diagnostics module. If Applicant intends to claim said feedback signal, the drawings should be amended to illustrate the signal or the feature(s) canceled from the claim(s). No new matter should be entered.

Referring to claims 50-52, Applicant claims an "enhancement module." This feature is not shown in the drawings.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

5. **Claim 39** is objected to because it recites "the system of claim 43" where it should recite --the system of claim 38--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. **Claims 50-52** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Specifically, claim 50 recites the limitation, "further including an enhancement module that generates an evolving set of design rules." The Examiner does not find sufficient support for this limitation in the specification such that one skilled in the art would be enabled to make and/or use the invention [see rejection under 112 second paragraph, below].

8. As dependent claims, claims 51 and 52suffers from the same deficiencies as claim 50.

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. **Claims 42 and 54** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, claim 42 recites, "wherein said diagnostics module generates said health assessment signal based on said driving output." However, claim 41 recites that the driving output is based on said health assessment signal and further that the driving output is applied to the motor (not to the diagnostic unit). Because claim 42

depends on claim 41 and because both limitations can not simultaneously be true, the claim is indefinite. The examiner interprets that claim 42 should recite "wherein said controller generates said driving output based on said health assessment signal," in which case claim 42 repeats the limitation found in claim 41. Alternatively, if Applicant intends to claim a feedback signal from the controller to the diagnostics module wherein the health assessment signal is *at least partially based on* the driving output, the claim should be amended to make this clear.

11. As a dependent claim, claim 54 suffers from the same deficiencies as claim 42.

12. **Claims 50-52** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, claim 50 recites the limitation, "further including an enhancement module that generates an evolving set of design rules." First, support for this limitation is not found in the specification. Second, it is not clear to the Examiner what is meant by the term "evolving," which is usually used in the context of genetic programming or genetic algorithms. Applicant has disclosed no such methods. Therefore, for the purpose of applying prior art, the Examiner interprets that Applicant intends for the term "evolving" to be read broadly as meaning "changing over time." The Examiner finds that any trainable neural network "changes over time" so as to facilitate designing an improved version of the system.

13. As dependent claims, claims 51 and 52suffers from the same deficiencies as claim 50.

Claim Rejections - 35 USC § 102

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

15. **Claims 1-3, 5-7, 10, 11, 15 and 32** are rejected under 35 U.S.C. 102(b) as being anticipated by Haynes et al (US 4,965,513) (hereinafter Haynes).

16. As for claims 1 and 32, Haynes discloses a diagnostics and control system for controlling a motorized system and diagnosing the health thereof, comprising:

a controller operatively associated with the motorized system and adapted to operate the motorized system in a controlled fashion [control panel, col. 4, lines 3-23, "Referring now to Fig. 1...worm gear 23."]; and

a diagnostics system operatively associated with the motorized system and adapted to diagnose the health of the motorized system according to a measured attribute associated with the motorized system [col. 3, lines 19-26, "Briefly, the present...may be observed."].

17. As for claim 2, Haynes discloses the diagnostics and control system of claim 1, wherein the measured attribute comprises at least one of vibration, pressure, current, speed, and temperature [col. 3, lines 9-14, "Further, it is an object...motor of the device."].

18. As for claim 3, Haynes discloses the diagnostics and control system of claim 1, wherein the motorized system comprises a motor and a load, and wherein the load comprises at least one of a valve, a pump, a conveyor roller, a fan, a compressor, and a gearbox [col. 4, lines 3-23, "Referring now to Fig. 1...worm gear 23."].

19. As for claim 5, Haynes discloses the diagnostics and control system of claim 1, wherein the measured attribute comprises at least one vibration signal obtained from a sensor associated with a motor in the motorized system [As known to those of ordinary skill in the art, the sensed motor current contains "noise" representative of system vibrations.; col. 3, lines 9-14, "Further, it is an object...motor of the device."; col. 5, lines 42-50, "Motor current noise...into electrical noise."].

20. As for claim 6, Haynes discloses the diagnostics and control system of claim 5, wherein the diagnostics system is adapted to diagnose the health of at least one of a motor bearing, motor shaft alignment, and motor mounting according to the measured vibration [col. 5, lines 35-50, "In addition to...into electrical noise."].

21. As for claim 7, Haynes discloses the diagnostics and control system of claim 6, wherein the diagnostics system is adapted to perform frequency spectral analysis of the vibration signal [col. 5, line 51-col. 6, line 57, "Referring now to...as the valve ages."].

22. As for claim 10, Haynes discloses the diagnostics and control system of claim 1, wherein the motorized system comprises a motorized pump, wherein the measured attribute comprises at least one vibration signal obtained from a sensor associated with the pump, and wherein the diagnostics system is adapted to diagnose the health of the pump according to

the measured vibration [col. 7, line 59 - col. 8, line 22, "The method is further...pump wheel frequency."].

23. As for claim 11, Haynes discloses the diagnostics and control system of claim 10, wherein the diagnostics system is adapted to perform frequency spectral analysis of the vibration signal [col. 5, line 51-col. 6, line 57, "Referring now to...as the valve ages."].

24. As for claim 15, Haynes discloses the diagnostics and control system of claim 1, wherein the motorized system comprises a motorized pump, wherein the measured attribute comprises a current associated with a motor in the motorized system, and wherein the diagnostics system provides a diagnostics signal indicative of pump cavitation according to the measured current [col. 7, line 59 - col. 8, line 22, "The method is further...pump wheel frequency."].

25. **Claims 1-7, 10, 11, 15, 31-34, 36, 37, 41-43, 45-47, 49, and 53-55** are rejected under 35 U.S.C. 102(e) as being anticipated by Hays et al (US 6,260,004 B1) (hereinafter Hays).

26. As for claims 1 and 32, Hays discloses a diagnostics and control system for controlling a motorized system and diagnosing the health thereof, comprising:

a controller operatively associated with the motorized system and adapted to operate the motorized system in a controlled fashion [micro-controller/PID controller 188, Fig. 4a]; and

a diagnostics system operatively associated with the motorized system and adapted to diagnose the health of the motorized system according to a measured attribute associated with the motorized system [col. 6, lines 23-42, "The system apparatus...reducing pump wear."].

27. As for claim 2, Hays discloses the diagnostics and control system of claim 1, wherein the measured attribute comprises at least one of vibration, pressure, current, speed, and temperature [col. 1, lines 40-65, "Vibration monitoring equipment...called an 'orbit.'"; "col. 10, line 49 - col. 11, line 29, "Diagnostics apparatus 24...computing device 38."; vibration sensor 80, Fig. 1; col. 12, lines 63-66, "Machine sensors may...rotating equipment 14."].

28. As for claim 3, Hays discloses the diagnostics and control system of claim 1, wherein the motorized system comprises a motor and a load, and wherein the load comprises at least one of a valve, a pump, a conveyor roller, a fan, a compressor, and a gearbox [col. 6, lines 46-57, "Thus, the present invention...equipment monitoring variables."].

29. As for claim 4, Hays discloses the diagnostics and control system of claim 1, wherein the diagnostics system provides a diagnostics signal according to the health of the motorized system, and wherein the controller provides a control signal to the motorized system according to at least one of a setpoint and the diagnostics signal [col. 14, lines 45-62, "In one embodiment...to rotating machine 14."].

30. As for claim 5, Hays discloses the diagnostics and control system of claim 1, wherein the measured attribute comprises at least one vibration signal obtained from a sensor associated with a motor in the motorized system [vibration sensor 80, Fig. 1; col. 12, lines 63-66, "Machine sensors may...rotating equipment 14."; col. 13, lines 7-12, "Diagnostic apparatus 24...variables thereto."].

31. As for claim 6, Hays discloses the diagnostics and control system of claim 5, wherein the diagnostics system is adapted to diagnose the health of at least one of a motor bearing, motor

shaft alignment, and motor mounting according to the measured vibration [col. 13, lines 7-12, "Diagnostic apparatus 24...variables thereto."].

32. As for claim 7, Hays discloses the diagnostics and control system of claim 6, wherein the diagnostics system is adapted to perform frequency spectral analysis of the vibration signal [col. 24, lines 31-55, "Referring to Fig. 16...by box 1614."].

33. As for claim 10, Hays discloses the diagnostics and control system of claim 1, wherein the motorized system comprises a motorized pump, wherein the measured attribute comprises at least one vibration signal obtained from a sensor associated with the pump, and wherein the diagnostics system is adapted to diagnose the health of the pump according to the measured vibration [col. 12, lines 63-66, "Machine sensors may...rotating equipment 14."; col. 13, lines 7-12, "Diagnostic apparatus 24...variables thereto."].

34. As for claim 11, Hays discloses the diagnostics and control system of claim 10, wherein the diagnostics system is adapted to perform frequency spectral analysis of the vibration signal [col. 24, lines 31-55, "Referring to Fig. 16...by box 1614."].

35. As for claim 15, Hays discloses the diagnostics and control system of claim 1, wherein the motorized system comprises a motorized pump, wherein the measured attribute comprises a current associated with a motor in the motorized system, and wherein the diagnostics system provides a diagnostics signal indicative of pump cavitation according to the measured current [col. 8, lines 44-48, "The method is based...wear and tear."; col. 13, lines 13-18, "By receiving data...impending maintenance."].

36. As for claim 31, Hays discloses the diagnostics and control system of claim 1, wherein the diagnostics system comprises at least one of a neural network, an expert system, and a

data fusion component [col. 4, lines 27-52, "MARINTEK has undertaken...for pump maintenance."].

37. As for claim 33, Hays discloses the method of claim 32, further comprising providing a diagnostics signal indicative of the health of the motorized system, wherein operating the motor comprises controlling the motor according to at least one of a setpoint and the diagnostics signal [col. 14, lines 45-62, "In one embodiment...to rotating machine 14."].

38. As for claim 34, Hays discloses the method of claim 33, further comprising measuring an attribute associated with the motorized system, wherein providing the diagnostics signal comprises obtaining a frequency spectrum of the measured attribute and analyzing the frequency spectrum in order to detect at least one fault in the motorized system [col. 24, lines 31-55, "Referring to Fig. 16...by box 1614."].

39. As for claim 36, Hays discloses the method of claim 32, wherein diagnosing the health of the motorized system according to a measured attribute associated with the motorized system comprises:

providing the measured attribute to at least one of a neural network, an expert system, and a data fusion component [col. 4, lines 41-52, "Recent published research...for pump maintenance."]; and

providing a diagnostics signal indicative of the health of the motorized system from the at least one of a neural network, an expert system, and a data fusion component [col. 4, lines 41-52, "Recent published research...for pump maintenance."].

40. As for claim 37, Hays discloses the method of claim 36, wherein operating the motor comprises controlling the motor according to at least one of a setpoint and the diagnostics signal [col. 14, lines 55-62, "In another embodiment...to rotating machine 14."].

41. As for claims 41 and 42, Hays discloses an integrated control and diagnostics system for a motor, the system comprising:

a diagnostics module to generate a health assessment signal indicative of the health of the motor [computer 38, Fig. 1; col. 6, lines 23-42, "The system apparatus...reducing pump wear."];

a controller coupled to the motor, said controller outputting a driving output based on said health assessment signal, wherein said driving output is applied to the motor [micro-controller/PID controller 188, Fig. 4a; col. 6, lines 23-42, "The system apparatus...reducing pump wear."].

42. As for claim 43, Hays discloses the control and diagnostics system according to claim 41, wherein said controller is associated with at least one controllable parameter, said parameter being controllable in response to said health assessment signal [col. 6, lines 23-42, "The system apparatus...reducing pump wear."].

43. As for claim 45, Hays discloses the control and diagnostics system according to claim 41, further including at least one sensor, said sensor generating a signal indicative of a parameter associated with the motor, wherein the health assessment signal is based on the sensor signal [col. 13, lines 7-18, "Diagnostic apparatus...impending maintenance."].

44. As for claim 46, Hays discloses the control and diagnostics system according to claim 45, wherein said controller includes a velocity feedback loop and a torque feedback loop [col. 13, lines 39-50, "Additional machine sensors...rotating machine 14."].

45. As for claim 47, Hays discloses the control and diagnostics system according to claim 46, wherein said velocity feedback loop generates a current reference signal in response to the sensor signal, and said torque feedback loop generates the driving output in response to the current reference signal [col. 13, lines 39-50, "Additional machine sensors...rotating machine 14."].

46. As for claim 49, Hays discloses the control and diagnostics system according to claim 45, wherein said motor parameter is one of a group consisting of velocity and vibration [col. 13, lines 7-18, "Diagnostic apparatus...impending maintenance."].

47. As for claim 53, Hays discloses the control and diagnostics system according to claim 41, wherein said diagnostics module includes an ASIC that generates the health assessment signal based on a process constraint [Fig. 4a].

48. As for claim 54, Hays discloses the control and diagnostics system according to claim 42, wherein said health assessment signal is indicative of whether the motor is deviating from a normal operating characteristic [col. 6, lines 23-42, "The system apparatus...reducing pump wear."].

49. As for claim 55, Hays discloses the control and diagnostics systems according to claim 41, further comprising a coordination module coupled to a plurality of the control and diagnostics systems, wherein said coordination module alters the driving output associated with one of the control and diagnostics systems based on the driving output of another one of

the control and diagnostics systems [col. 13, lines 39-50, "Additional machine sensors...rotating machine 14."].

50. **Claims 38-40** are rejected under 35 U.S.C. 102(e) as being anticipated by Grayson et al (US 5,111,431) (hereinafter Grayson).

51. As for claim 38, Grayson discloses a system for controlling a motorized system and diagnosing the health thereof, comprising:

means for operating a motor in the motorized system in a controlled fashion [Fig. 1]; and

means for diagnosing the health of the motorized system according to a measured attribute associated with the motorized system [Fig. 2].

52. As for claim 39, Grayson discloses the system of claim 43 (38), wherein the means for diagnosing the health of the motorized system comprises at least one of a neural network, an expert system, and a data fusion component [neural network, Fig. 2].

53. As for claim 40, Grayson discloses the system of claim 38, wherein the motorized system comprises a motor and a load, and wherein the load comprises at least one of a valve, a pump, a conveyor roller, a fan, a compressor, and a gearbox [col. 3, lines 3-14, "The fast-acting devices...are PID controllers."].

54. **Claim 56** is rejected under 35 U.S.C. 102(e) as being anticipated by Madhavan (US 6,004,017) (hereinafter Madhavan).

55. As for claim 56, Madhavan discloses the control and diagnostics system for a controlled system, the system comprising:

a diagnostics module to (1) generate a health assessment signal indicative of the health of the controlled system, and (2) predict an operating state of the controlled system in response

to said health assessment signal and generate a corresponding prognostics signal [col. 2, lines 37-46, "In carrying out...limit cycle oscillations."]; and

a controller integrated into the controlled system, said controller outputting a driving output to the controlled system based on said prognostics signal [col. 2, lines 47-52, "Still further in...the classifier signal."].

Claim Rejections - 35 USC § 103

56. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

57. **Claim 44** is rejected under 35 U.S.C. 103(a) as being unpatentable over Hays (US 6,260,004 B1). As for claim 44, Hays does not specifically disclose the use of an inverter. "Official Notice" is given that the both the use and advantages of inverters are known and expected in the control arts. It would have been obvious to one of ordinary skill in the art to modify Hays by using an inverter because it is common for various controllers and sensors to require an inverted signal. For example, inverters are commonly used with summing elements to compute an error or difference signal.

58. **Claims 8, 9, 12-14 and 16-19** are rejected under 35 U.S.C. 103(a) as being obvious over Hays (US 6,260,004 B1) in view of Ogi et al (US 5,419,197) (hereinafter Ogi).

59. As for claims 8 and 12, although Hays discloses the use of artificial intelligence in control networks [col. 4, lines 41-52, "Recent published research...for pump maintenance."], Hays does not specifically disclose a diagnostics system comprising at least one of a neural network or an expert system, wherein frequency spectral analysis is performed using the at least one of a neural network or expert system. Ogi teaches a diagnostics system comprising at least one of a neural network or an expert system, wherein frequency spectral analysis is performed using the at least one of a neural network or expert system [col. 2, lines 29-57, "In order to achieve...the lapse of time."; col. 4, lines 45-57, "Subsequently, the normalized...the power supply."]. It would have been obvious to one of ordinary skill in the art to modify Hays by using a diagnostics system comprising at least one of a neural network or an expert system, wherein frequency spectral analysis is performed using the at least one of a neural network or expert system, because this would provide the advantage of an adaptable system that can be used with a variety of sensor and equipment types, as taught by Hays [col. 2, lines 18-28, "It is an object...the lapse of time."].

60. As for claims 9 and 13, Hays discloses a diagnostics and control system similar to claims 8 and 12, wherein the controller provides a control signal to the motorized system according to at least one of a setpoint and the diagnostics signal [col. 14, lines 45-62, "In one embodiment...to rotating machine 14."].

61. As for claim 14, Hays discloses a diagnostics and control system similar to claim 12, wherein the diagnostics system employs data fusion techniques in order to derive the at least one vibration signal from at least one sensor associated with the motorized system [col. 4, lines 41-52, "Recent published research...for pump maintenance."].

62. As for claim 16, although Hays discloses the use of artificial intelligence in control networks [col. 4, lines 41-52, "Recent published research...for pump maintenance."], Hays does not specifically disclose a diagnostics system comprising a neural network adapted to synthesize a change in condition signal from the measured current. Ogi discloses a neural network adapted to synthesize a change in condition signal from the measured current [col. 2, lines 29-57, "In order to achieve...the lapse of time."; col. 4, lines 45-57, "Subsequently, the normalized...the power supply."]. It would have been obvious to one of ordinary skill in the art to modify Hays by using a diagnostics system comprising a neural network adapted to synthesize a change in condition signal from the measured current, because this would provide the advantage of an adaptable system that can be used with a variety of sensor and equipment types, as taught by Hays [col. 2, lines 18-28, "It is an object...the lapse of time."].

63. As for claim 17, Hays does not specifically teach the use of a preprocessing portion operatively coupled to neural network nor a post processing portion coupled to the neural network for determining whether the change in condition signal is due to a fault condition. Ogi teaches the use of a preprocessing portion operatively coupled to neural network and a post processing portion coupled to the neural network for determining whether the change in condition signal is due to a fault condition [col. 4, lines 9-13, "A processor 10 further...digital computer."]

64. As for claim 18, neither Hays nor Ogi specifically disclose the use of a fuzzy rule based expert system. "Official Notice" is given that both the use and advantages of fuzzy rule based expert systems are known and expected in the art. It would have been obvious to one of ordinary skill in the art to modify the teachings of Hays and Ogi by using a fuzzy rule

based expert system because this would allow for making decisions based on general rules of diagnosis or control.

65. As for claim 19, Hays discloses a diagnostics and control system similar to claim 18, wherein the diagnostics system is adapted to detect at least one fault relating to the operation of the pump and at least one fault relating to the operation of the motor driving the pump according to the measured current [col. 12, lines 63-66, "Machine sensors may...rotating equipment 14."; col. 13, lines 7-12, "Diagnostic apparatus 24...variables thereto."].

66. **Claims 20-30 and 35** are rejected under 35 U.S.C. 103(a) as being obvious over Hays (US 6,260,004 B1) in view of Petsche et al (US 5,640,103).

67. As for claims 20-26 and 35, although obvious to one of ordinary skill in the art, Hays does not specifically disclose obtaining a space vector angular fluctuation from a current signal relating to operation of the motor in order to detect a fault in the motor. Petsche teaches obtaining a space vector angular fluctuation from a current signal relating to operation of the motor in order to detect a fault in the motor [col. 3, line 52-col. 4, line 2, "In accordance with...the training phase."]. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Hays by obtaining a space vector angular fluctuation from a current signal relating to operation of the motor in order to detect a fault in the motor, because this would facilitate the detection and correction of motor faults, as taught by Petsche [col. 1, lines 8-19, "The present invention...or abnormally, respectively."]. Furthermore, the various modifications recited in claims 22-26 would be obvious to one of ordinary skill in the art because, as demonstrated by Petsche, the use of space vectors for representing and analyzing time-varying current signals is well known in the art.

68. As for claim 27, Hays discloses the diagnostics and control system of claim 26, wherein the diagnostics system is adapted to analyze fluctuations in amplitude of the first spectral component in order to detect at least one fault associated with the motorized system [col. 1, line 48 - col. 2, line 14, "Monitoring machine performance...CSI Application paper...."].

69. As for claim 28, Hays discloses the diagnostics and control system of claim 27, wherein the first frequency is approximately twice the frequency of power applied to a motor in the motorized system [col. 1, line 48 - col. 2, line 14, "Monitoring machine performance...CSI Application paper...."].

70. As for claim 29, Hays does not specifically disclose the use of the Goertzel algorithm. "Official Notice" is given that both the use and advantages of the Goertzel algorithm are well known and expected in the art. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Hays by using a Goertzel algorithm to extract the amplitude of the first spectral component in order to analyze the amplitude of the first spectral component, because this is a well known method of spectral analysis.

71. As for claim 30, Hays discloses the diagnostics and control system of claim 29, wherein the at least one fault comprises at least one of a stator fault, a rotor fault, and an imbalance in the power applied to the motor in the motorized system [col. 13, lines 7-18, "Diagnostic apparatus...impending maintenance."].

72. **Claim 48** is rejected under 35 U.S.C. 103(a) as being obvious over Hays (US 6,260,004 B1) in view of Gotou et al (US 4,933,834) (hereinafter Gotou). As for claim 48, Hays does not specifically disclose the use of P-I controller to generate the current reference signal. Gotou teaches the use of a P-I controller in a velocity feedback loop to generate the current

reference signal [col. 1, lines 13-31, "In conventional control systems...in recent years."]. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Hays by using a P-I controller to generate the current reference signal in a velocity feedback loop, because PI controllers are widely used in motor control systems to improve robustness and suppress the influence of disturbances, as taught by Gotou [col. 1, lines 13-31, "In conventional control systems...in recent years."].

73. **Claims 50-52** are rejected under 35 U.S.C. 103(a) as being obvious over Hays (US 6,260,004 B1) in view of Grayson et al (US 5,111,531) (hereinafter Grayson).

74. As for claim 50, Hays does not specifically disclose an enhancement module that generates an evolving set of design rules based on a plurality of health assessment signals. Grayson teaches an enhancement module that generates an evolving set of design rules based on a plurality of health assessment signals [neural network, Fig. 2]. It would have been obvious to one of ordinary skill in the art to modify Hays by using an enhancement module that generates an evolving set of design rules based on a plurality of health assessment signals, because this would allow for training and improvement of the system, as taught by Grayson [col. 3, line 63 - col. 4, line 44, "A computer task...at different times."].

75. As for claim 51, Hays discloses the control and diagnostics system according to claim 50, wherein each health assessment signal is generated in response to at least one signal generated by a sensor that monitors at least one parameter associated with the motor [col. 13, lines 7-18, "Diagnostic apparatus...impending maintenance."].

76. As for claim 52, Hays does not specifically disclose a model embedded memory of the enhancement module to generate an evolving set of design rules. Grayson teaches a model

embedded memory of the enhancement module to generate an evolving set of design rules [col. 3, line 63 - col. 4, line 44, "A computer task...at different times."]. It would have been obvious to one of ordinary skill in the art to modify Hays by using a model embedded memory of the enhancement module to generate an evolving set of design rules, because this would allow for training and improvement of the system, as taught by Grayson [col. 3, line 63 - col. 4, line 44, "A computer task...at different times."].

Conclusion

77. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 6,144,924, note Fig. 1; US 6,006,170, note use of vector representation; US 5,349,541, note Fig. 1; US 5,121,467, note use of neural networks and expert system for process control; US 5,784,273, note use of Goertzel algorithm; US 5,941,305, note use of neural, expert and fuzzy logic in a pump-motor system.

78. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron C Perez-Daple whose telephone number is (703)305-4897. The examiner can normally be reached on 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anil Khatri can be reached on (703)305-0282. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-4700.

12/10/03

Aaron Perez-Daple

ANIL KHATRI
SUPERVISORY PATENT EXAMINER